ORIGINAL RESEARCH

RAE ENDOTRACHEAL TUBES SIZES FOR CHILDREN UNDERGOING CLEFT LIP AND PALATE SURGERY.

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ABSTRACT :

Background: Appropriate sizes (internal diameters) of RAE endotracheal tubes in children with cleft lip and palate, who generally have delayed growth and development in early infancy have not been explained.

Objectives: The aim of the current study was to identify the proper size of REA endotracheal tube for intubation used for cleft lip and palate surgery and intubation outcomes in these patients.

Material and methods: 60 cleft lip and palate patients were selected for analytic cross-sectional study. The proper tube size was determined by normal children formula. Then tube size was confirmed by patients' minimum resistance to intubation, proper ventilation, and appropriate air leakage at an airway pressure of 15-20 cm H2O. Number of attempts of intubation and the largest endotracheal tube size were recorded.

Results: The average age, weight and height of patients were 22.40±4.85 months, 9.88±1.28 kg, 72.40±24.50 cm respectively. The average RAE endotracheal tube size and frequency of intubation trials were 4.25±0.78 and 1.62±0.70, respectively. 6 cases required RAE endotracheal tube size smaller than the recommended size.

Conclusions: In cleft lip and plate child, the predicted RAE endotracheal tube size was similar to standard normal child tube size. Smaller RAE tube size was required for subglottic stenosis.

KEYWORDS: Children; REA endotracheal tube; cleft lip and palate; general anaesthesia.

INTRODUCTION :

Cleft lips and palates surgeries are the most common birth deformities corrective surgeries.[1] Cleft lip deformities occur with the second highest incidence among Asians (2.1 in 1000) and the highest among Native Americans (3.6 in 1000 births). However, it has the lowest incidence in blacks (0.41 in 1000)[2]. The incidence of cleft palate does not differ among ethnic groups and is reported as 0.5 in 1000 live births. These clefts are associated with other multiple anomalies. More than one hundred syndromes are described in association with cleft lip and palate but fortunately, they are very rare[3]. Few more common anomalies associated with cleft lip and palates are Pierre Robin syndrome, micrognathia, glossoptosis, Treacher Collins, and Klippel Feil.[4]

The cleft lip and palate children faces many difficulties during drinking and eating. They also have breathing problems, improper dental development, facial beauty problems, psychological problems and oral and listening deficiencies, which eventually cause death if not treated. Therefore, patients are more concerned for surgery as soon as possible. Cleft lip and palate repair surgery and their anaesthetic management, both are challenging for the surgeon and the anaesthesiologist[5]. Anaesthetic management for cleft lip and palate surgery is complicated and difficult intubation is reported from 4.7 to 8.4% of the patients[6-8].

Difficulties decrease with increasing age[9]. Contrary to these finding, Kohtijani et al. standard normal children endotracheal tube size was advised for cleft lip/palate patients[10]. The of this study was to identify the proper size of RAE endotracheal tube in intubation for cleft lip and palate patients and their outcomes.

METHODS :

In this analytic cross-sectional study, 63 cleft lip and/or palate patients were selected for corrective surgery for cleft lip and palate at Indira Gandhi Institute of Medical Sciences, Patna between November 2020 to May 2022. Inclusion criteria were unilateral/ bilateral cleft lip, unilateral/ bilateral cleft

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palate, combined cleft lip and palate of age group of 10 weeks to 6 years of either sex. The exclusion criteria were previous history of intubation for a long time, history of ICU admission and presence of syndromic features. Demographic findings, surgical history and admission, other anomalies were reported. All patients underwent surgery under general anesthesia after proper written consent from parent. Intubation was performed by single anesthesiologist to prevent any bias. Frequency of intubation trials and the largest endotracheal tube size were recorded for all patients. Proper tube size was defined by the Cole formula (age/4 + 4) for RAE endotracheal tubes without cuff, the Motoyama formula (age/4 + 3.5) for RAE cuffed endotracheal tubes in two-year children or older, and the Khine formula (age/4 + 3.0) for cuffed endotracheal tubes in children younger than two. The proper size was confirmed with their minimum resistance to intubation, proper ventilation reported by anesthesiologist and an appropriate air leakage at an airway pressure of 15-20 cm H2O. After failed intubation, smaller size of endotracheal tube would be tried. Number of attempts of intubation and the largest endotracheal tube size were recorded.[11]

RESULTS :

Sixty cleft lip/palate patients were enrolled in this study. Of them 35 patients or 58.3% were male and 25 patients or 41.67% were female. Their age average was 22.40±4.85 months, with 2.5 month for the youngest and 72 months for the eldest. The average weight, height and head circumference under operation were 9.88±1.28 kg, 72.40±24.50 cm and 44.11±5.81, respectively. Demographic data shown in Table1. The unilateral cleft lip (23.33%) and bilateral cleft palate (28.33%) were the commonest types of cleft. The complete cleft was found in 28 cases (46.7%) and incomplete cleft was found in 32 cases (53.3%). The incidence of different variations of cleft is shown in Table 2. Associated anomaly was reported in 16 patients (26.66%), among them the cardiac anomaly was the commonest (6 patients out of 16) with ASD in 3 patients, Tricuspid regurgitation in 2 and VSD in 1 patient. The history of previous surgery was positive in 12 cases (20.0%). The average size of the REA endotracheal tube was 4.25±0.78 with the average of 4. The range of from 3.5 to 6. The average of the normal endotracheal tube for the same age was 4.37±0.76 with the average of 4. The average of intubation trials was 1.62±0.70 with the mean of 1. The range of intubation trials was 1-3. Only 1 trial in 30 cases (50%), 2 trials in 18 cases (30%) and 3 trials for 12 cases (20%) of patients were recorded. Twenty cuffed endotracheal tubes (33.3%) and forty without cuff (66.6%) were used in this study. Considering the size of REA endotracheal tubes, in 6 cases (10%) the subglottic stenosis was observed which was associated with the smaller size of the REA endotracheal tube. No air leakage was reported in 20 cm underwater, while in 6 cases (10%), ventilation pressure was observed in above 30 cm. In 6 cases with subglottic stenosis, 2 (33.3%) was observed in unilateral cleft palate, 2 (33.3%) in unilateral cleft lip, 1 (16.65%) in unilateral cleft lip and palate, and one case (16.65%) were in bilateral cleft lip and palate. Subglottic stenosis was mostly found in unilateral cleft lip and palate patients, however difference was not significant. The subglottic stenosis was reported in one patient out of 14 (7.1%) with surgical history, and in six patients out of 46 (13%) with no surgical history. The presence of subglottic stenosis in patients with no surgical history was not significant (p-value = 0.88). The average intubation trials in patients with subglottic stenosis were 78/0±72/1. The average intubation trials in patients without subglottic stenosis were 83/0±63/1. There was no significant difference found between these two groups (p-value = 0.77). In Table 3, different REA endotracheal tube sizes were presented. Table 3 shows the largest size of RAE endotracheal tube in unilateral cleft lip and bilateral cleft palate and these might be due to the age difference.

Table1: Demographic data.

	Mean±SD or n
Age (in months)	22.40±4.85
Gender (Male/Female)	35/25
Weight (in Kg)	9.88±1.28
Height (in cm)	72.40±24.50
Head Circumference	44.11±5.81

Table 2 Frequency of cleft lip and palate types

Deformity type	No. of patients	Percent (%)
Unilateral cleft lip	14	23.33
Bilateral cleft lip	5	8.33
Unilateral cleft palate	8	13.33
Bilateral cleft palate	17	28.33
Unilateral cleft lip and palate	5	8.33
Bilateral cleft lip and palate	11	18.33

Table 3 The REA endotracheal tube sizes in different clefts

	Mean	SD	95% IC For the mean Lower bound	Upper bound	Min	Max
Unilateral cleft lip	4.37	0.76	3.87	5.68	3.50	6
Bilateral cleft lip	4.48	0.51	4.01	4.57	3.50	5
Unilateral cleft palate	4.82	0.61	4.06	5.45	4	5.5
Bilateral cleft palate	5.27	1.86	2.47	6.38	4	6
Unilateral cleft lip and palate	4.30	0.77	3.41	5.46	3.50	5.5
Bilateral cleft lip and palate	4.18	0.37	3.75	4.31	3.50	4.5

DISCUSSION :

Cleft lip and palate patients need early surgical management. In these patients, identifying appropriate size of RAE endotracheal tubes is difficult due to varying degree of delayed growth and development in early infancy and it is association with subglottic stenosis and other anomalies. Cleft lip and palate are the most common congenital anomalies of facial area. Anaesthetic management for cleft lip and palate surgeries poses difficulties in intubation[3,5]. The congenital anomalies with medical conditions and subglottic stenosis also responsible for difficult anesthesia.[11] In this study, 60 cleft lip and palate patient with the average age of 21.39 months of age were investigated. The average of the RAE endotracheal tube size and the frequency of the intubation trials were 4.37±0.76 and 1.63 + 0.8, respectively. The minimum trial was one, however the maximum trials was 3. Difficult intubation was found in 40% of the patients. No intubation failure was detected. This finding was different from the findings of Adenekan et al. who reported one intubation failure and only one difficult intubation[12]. Desalu et al. observed 2% intubation failure and 2% difficult intubation in their study[13]. The narrowest airway is the subglottis in children.[14,15].

In the current study, subglottic stenosis was found in 6 (10%) cleft lip and palate children including 2 case in unilateral cleft palate, 2 cases in unilateral cleft lip, 1 case in unilateral cleft lip and palate, and 1 cases in bilateral cleft lip and palate. In this study, only nonsyndromic patients were included, thus overall rate of subglottic stenosis in cleft lip and palate is more than this result. Similarly, Knapp et al. the subglottic stenosis in five patients (33%) was associated to Pierre Robin syndrome which one of its triad is cleft palate[16]. In children associated to anomalies, the subglottic stenosis is commonly seen and increases with age. Accordingly, the RAE endotracheal tube size and type can be different from the normal children. Knapp et al observed 73% of the patients required smaller tracheal tubes than usually used for normal children of same age and sex group[16]. In the current study, however, only 6 out of 60 children (10%) needed smaller tracheal tubes than those usually used for normal children of similar age and sex. The bilateral cleft have more developing defects like laryngeal anomalies. Although result was not significant, 5 of them had unilateral cleft versus 2 with bilateral cleft. Limitations are selection bias, small sample size and excluding syndromic patients which associate more frequently with bilateral cleft. Our findings were similar to the findings of Kohjitani et al. who studied 236 cleft lip and cleft palate patient and did not report any cases of smaller tracheal tubes used from those used in normal children of similar age and sex.[10]

CONCLUSION :

In cleft lip and plate child, the predicted RAE endotracheal tube size was similar to standard normal child tube size. However, in syndromic child, where incidence of subglottic stenosis is high, requires smaller RAE tube size than normal predicted size. This study was restricted to a small sample of patients with limited range of age. Further study with larger sample size is required for proper guidelines for intubation in

cleft lip and palate patients.

Conflict of interest: Nil

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